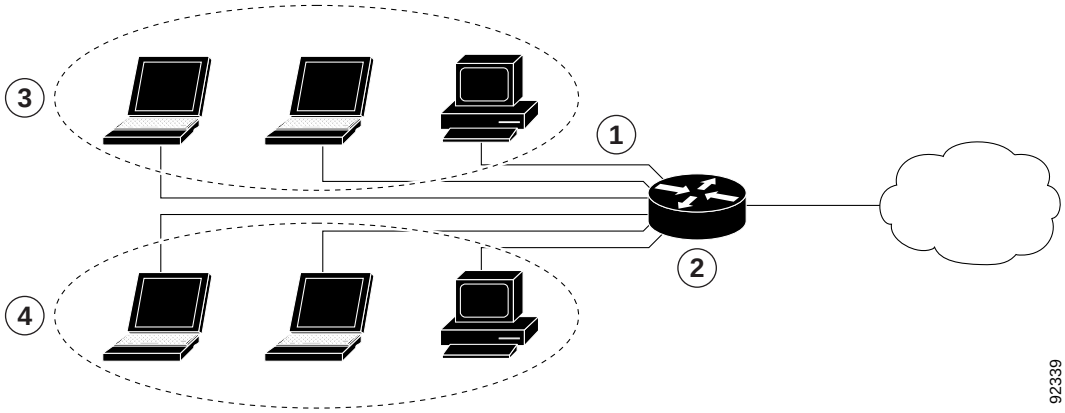
Configuring a LAN with DHCP and VLANs

The Cisco 1800 series integrated services fixed-configuration routers support clients on both physical LANs and virtual LANs (VLANs). The routers can use the Dynamic Host Configuration Protocol (DHCP) to enable automatic assignment of IP configurations for nodes on these networks.

Figure 5-1 shows a typical deployment scenario with two physical LANs connected by the router and two VLANs.

Figure 5-1 Physical and Virtual LANs with DHCP Configured on the Cisco Router



1	Fast Ethernet LAN (with multiple networked devices)
2	Router and DHCP server—Cisco 1800 series integrated services router—connected to the Internet
3	VLAN 1
4	VLAN 2

DHCP

DHCP, which is described in RFC 2131, uses a client/server model for address allocation. As an administrator, you can configure your Cisco 1800 integrated services fixed-configuration router to act as a DHCP server, providing IP address assignment and other TCP/IP-oriented configuration information to your workstations. DHCP frees you from having to manually assign an IP address to each client.

When you configure a DHCP server, you must configure the server properties, policies, and DHCP options.

Note Whenever you change server properties, you must reload the server with the configuration data from the Network Registrar database.

VLANs

The Cisco 1800 series integrated services routers (fixed) support eight Fast Ethernet ports on which you can configure VLANs.

VLANs enable networks to be segmented and formed into logical groups of users, regardless of the user's physical location or LAN connection.

Configuration Tasks

Perform the following tasks to configure this network scenario:

- Configure DHCP
- Configure VLANs

Note The procedures in this chapter assume you have already configured basic router features as well as PPPoE or PPPoA with NAT. If you have not performed these configurations tasks, see Chapter 1, "Basic Router Configuration," Chapter 3, "Configuring PPP over Ethernet with NAT," and Chapter 4, "Configuring PPP over ATM with NAT" as appropriate for your router.

Configure DHCP

Perform these steps to configure your router for DHCP operation, beginning in global configuration mode:

	Command	Purpose

Step 1	**ip domain name** *name*
	
	Example:
	`Router(config)# ip domain name smallbiz.com`
	`Router(config)#`
		Identifies the default domain that the router uses to complete unqualified hostnames (names without a dotted-decimal domain name).

Step 2	**ip name-server** *server-address1* [*server-address2...server-address6*]
	
	Example:
	`Router(config)# ip name-server 192.168.11.12`
	`Router(config)#`
		Specifies the address of one or more Domain Name System (DNS) servers to use for name and address resolution.

	Command	Purpose
Step 3	**ip dhcp excluded-address** *low-address* [*high-address*] **Example:** `Router(config)# ip dhcp excluded-address 192.168.9.0`	Specifies IP addresses that the DHCP server should not assign to DHCP clients. In this example, we are excluding the router address.

Step 4	**ip dhcp pool** *name*
	
	Example:
	`Router(config)# ip dhcp pool dpool1`
	`Router(config-dhcp)#`
		Creates a DHCP address pool on the router and enters DHCP pool configuration mode. The *name* argument can be a string or an integer.

Step 5	**network** *network-number* [*mask* | *prefix-length*]
	
	Example:
	`Router(config-dhcp)# network 10.10.0.0 255.255.255.0`
	`Router(config-dhcp)#`
		Defines subnet number (IP) address for the DHCP address pool, optionally including the mask.

Step 6	**import all**
	
	Example:
	`Router(config-dhcp)# import all`
	`Router(config-dhcp)#`
		Imports DHCP option parameters into the DHCP portion of the router database.

Step 7	**default-router** *address* [*address2...address8*]
	
	Example:
	`Router(config-dhcp)# default-router 10.1.1.1`
	`Router(config-dhcp)#`
		Specifies up to 8 default routers for a DHCP client.

Step 8	**dns-server** *address* [*address2...address8*]
	
	Example:
	`Router(config-dhcp)# dns-server 192.168.35.2`
	`Router(config-dhcp)#`
		Specifies up to 8 DNS servers available to a DHCP client.

Step 9	**domain-name** *domain*
	
	Example:
	`Router(config-dhcp)# domain-name cisco.com`
	`Router(config-dhcp)#`
		Specifies the domain name for a DHCP client.

Step 10	**exit**
	
	Example:
	`Router(config-dhcp)# exit`
	`Router(config)#`
		Exits DHCP configuration mode, and enters global configuration mode.

Configuration Example

The following configuration example shows a portion of the configuration file for the DCHP configuration described in this chapter.

```
ip dhcp excluded-address 192.168.9.0
!
ip dhcp pool dpool1
   import all
   network 10.10.0.0 255.255.255.0
   default-router 10.10.10.10
   dns-server 192.168.35.2
   domain-name cisco.com
!
ip domain name smallbiz.com
ip name-server 192.168.11.12
```

Verify Your DHCP Configuration

Use the following commands to view your DHCP configuration.

- **show ip dhcp import**—Displays the optional parameters imported into the DHCP server database.
- **show ip dhcp pool**—Displays information about the DHCP address pools.
- **show ip dhcp server statistics**—Displays the DHCP server statistics, such as the number of address pools, bindings, and so forth.

```
Router# show ip dhcp import

Address Pool Name: dpool1

Router# show ip dhcp pool

Pool dpool1 :
 Utilization mark (high/low)    : 100 / 0
 Subnet size (first/next)       : 0 / 0
 Total addresses                : 254
 Leased addresses               : 0
 Pending event                  : none
 1 subnet is currently in the pool :
 Current index        IP address range                    Leased addresses
 10.10.0.1            10.10.0.1        - 10.10.0.254       0

Router# show ip dhcp server statistics
Memory usage         15419
Address pools        1
Database agents      0
Automatic bindings   0
Manual bindings      0
Expired bindings     0
Malformed messages   0
Secure arp entries   0

Message              Received
BOOTREQUEST          0
DHCPDISCOVER         0
DHCPREQUEST          0
DHCPDECLINE          0
DHCPRELEASE          0
DHCPINFORM           0
```

```
Message             Sent
BOOTREPLY           0
DHCPOFFER           0
DHCPACK             0
DHCPNAK             0
Router#
```

Configure VLANs

Perform these steps to configure VLANs on your router, beginning in privileged EXEC mode:

	Command	Purpose

Step 1	**vlan database**
	
	Example:
	`Router# vlan database`
	`Router(vlan)#`
		Enters VLAN configuration mode.

Step 2	**vlan** *vlan-id* [**media** *type*] [**name** *vlan-name*]
	
	Example:
	`Router(vlan)# vlan 2 media ethernet name VLAN0002`
	`Router(vlan)# vlan 3 media ethernet name red-vlan`
	`Router(vlan)#`
		Adds VLANs, with identifiers ranging from 2 to 1001.
		
		For details about this command and additional parameters that can be set, see the *Cisco IOS Switching Services Command Reference*.

Step 3	**exit**
	
	Example:
	`Router(vlan)# exit`
	`Router#`
		Updates the VLAN database, propagates it throughout the administrative domain, and returns to privileged EXEC mode.

Verify Your VLAN Configuration

Use the following commands to view your VLAN configuration.

- **show**—Entered from VLAN database mode. Displays summary configuration information for all configured VLANs.
- **show vlan-switch**—Entered from privileged EXEC mode. Displays detailed configuration information for all configured VLANs.

```
Router# vlan database
Router(vlan)# show
  VLAN ISL Id: 1
    Name: default
    Media Type: Ethernet
    VLAN 802.10 Id: 100001
    State: Operational
    MTU: 1500
    Translational Bridged VLAN: 1002
    Translational Bridged VLAN: 1003

  VLAN ISL Id: 1002
    Name: fddi-default
    Media Type: FDDI
    VLAN 802.10 Id: 101002
    State: Operational
    MTU: 1500
    Bridge Type: SRB
    Translational Bridged VLAN: 1
    Translational Bridged VLAN: 1003

  VLAN ISL Id: 1003
    Name: token-ring-default
    Media Type: Token Ring
    VLAN 802.10 Id: 101003
    State: Operational
    MTU: 1500
    Bridge Type: SRB
    Ring Number: 0
    Bridge Number: 1
    Parent VLAN: 1005
    Maximum ARE Hop Count: 7
    Maximum STE Hop Count: 7
    Backup CRF Mode: Disabled
    Translational Bridged VLAN: 1
    Translational Bridged VLAN: 1002

  VLAN ISL Id: 1004
    Name: fddinet-default
    Media Type: FDDI Net
    VLAN 802.10 Id: 101004
    State: Operational
    MTU: 1500
    Bridge Type: SRB
    Bridge Number: 1
    STP Type: IBM

  VLAN ISL Id: 1005
    Name: trnet-default
    Media Type: Token Ring Net
    VLAN 802.10 Id: 101005
    State: Operational
    MTU: 1500
```

```
    Bridge Type: SRB
    Bridge Number: 1
    STP Type: IBM

Router# show vlan-switch

VLAN Name                             Status    Ports
---- -------------------------------- --------- -------------------------------
1    default                          active    Fa0, Fa1, Fa2, Fa3
1002 fddi-default                     active
1003 token-ring-default               active
1004 fddinet-default                  active
1005 trnet-default                    active

VLAN Type  SAID       MTU   Parent RingNo BridgeNo Stp  BrdgMode Trans1 Trans2
---- ----- ---------- ----- ------ ------ -------- ---- -------- ------ ------
1    enet  100001     1500  -      -      -        -    -        1002   1003
1002 fddi  101002     1500  -      -      -        -    -        1      1003
1003 tr    101003     1500  1005   0      -        -    srb      1      1002
1004 fdnet 101004     1500  -      -      1        ibm  -        0      0
1005 trnet 101005     1500  -      -      1        ibm  -        0      0
Router#
```